

## WHAT IS CLAIMED IS:

1. A thermal processing apparatus irradiating a substrate with flash light thereby heating said substrate, comprising:

5 a light source having a flash lamp;

a holding element holding said substrate;

a light intensity measuring element measuring the intensity of light emitted from said flash lamp when said light source emits said light toward said substrate held by said holding element; and

10 an emission state detection element detecting the emission state of said flash lamp on the basis of a result of measurement by said light intensity measuring element.

2. The thermal processing apparatus according to claim 1, wherein

15 the intensity of light emitted from said flash lamp when the irradiation state on said substrate held by said holding element satisfies a prescribed criterion is regarded as standard luminous intensity, and

said emission state detection element compares said result of measurement by said light intensity measuring element with said standard luminous intensity for detecting the emission state of said flash lamp.

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3. The thermal processing apparatus according to claim 2, wherein

said flash lamp is a bar lamp having a long cylindrical shape, and

said light intensity measuring element measures the intensity of light components emitted from a plurality of portions including both ends of said flash lamp.

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4. The thermal processing apparatus according to claim 3, wherein  
said light source has a plurality of said flash lamps,  
said light intensity measuring element measures the intensity of light  
components emitted from each of said plurality of flash lamps, and

5 said emission state detection element detects the emission state of each of said  
plurality of flash lamps.

5. The thermal processing apparatus according to claim 4, further comprising  
an abnormality countermeasure element performing prescribed abnormality  
10 countermeasure processing when at least part of the emission states of the respective ones  
of said plurality of flash lamps detected by said emission state detection element does not  
satisfy a prescribed criterion.

6. The thermal processing apparatus according to claim 5, wherein  
15 said emission state detection element detects the emission state of each of said  
plurality of flash lamps every time the thermal processing apparatus performs  
photoirradiation on a substrate to be processed.

7. The thermal processing apparatus according to claim 6, wherein  
20 said light intensity measuring element includes:  
a plurality of optical fiber members guiding light components emitted from the  
respective ones of said plurality of flash lamps, and  
a single photodetector receiving said light components guided by said plurality  
of optical fiber members.

8. A thermal processing apparatus irradiating a substrate with light thereby heating said substrate, comprising:

a light source having a plurality of lamps;

a holding element holding said substrate;

5 a light intensity measuring element measuring the intensity of light components emitted from a plurality of portions of each of said plurality of lamps; and

an emission state detection element detecting the emission state of each of said plurality of lamps on the basis of results of measurement by said light intensity measuring element.

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9. The thermal processing apparatus according to claim 8, wherein

the intensity of light emitted from each of said plurality of lamps when the irradiation state on said substrate held by said holding element satisfies a prescribed criterion is regarded as standard luminous intensity, and

15 said emission state detection element compares said results of measurement by said light intensity measuring element with said standard luminous intensity for detecting the emission state of each of said plurality of lamps.

10. The thermal processing apparatus according to claim 9, further comprising  
20 an abnormality countermeasure element performing prescribed abnormality countermeasure processing when at least part of the emission states of the respective ones of said plurality of lamps detected by said emission state detection element does not satisfy a prescribed criterion.

25 11. The thermal processing apparatus according to claim 10, wherein

said light intensity measuring element includes:

a plurality of optical fiber members guiding light components emitted from the respective ones of said plurality of lamps, and

5 a single photodetector receiving said light components guided by said plurality of optical fiber members.

12. A thermal processing apparatus irradiating a substrate with flash light thereby heating said substrate, comprising:

a light source having a plurality of flash lamps;

10 a holding element holding said substrate;

a light intensity measuring element receiving light components emitted from said plurality of flash lamps by a photodetector when said light source emits light toward said substrate held by said holding element for measuring the intensity of received said light components; and

15 an emission state detection element detecting the emission state of each of said plurality of flash lamps on the basis of a result of measurement by said light intensity measuring element, wherein

said light intensity measuring element has:

20 a plurality of light introduction parts guiding said light components emitted from said plurality of flash lamps, and

an imaging part provided between first ends of said plurality of light introduction parts opposed to second ends facing said plurality of flash lamps and said photodetector for imaging introduced light components received from said plurality of flash lamps, guided to said introduction parts through said second ends and emitted from  
25 said first ends on said photodetector, and

the resolution of said imaging part is so adjusted as to enable identification of said introduced light components received from said plurality of flash lamps imaged on said photodetector respectively.

5           13. The thermal processing apparatus according to claim 12, wherein  
said imaging part has a diffusion plate diffusing said introduced light  
components.

10           14. The thermal processing apparatus according to claim 13, wherein  
said imaging part has a lens group formed by a plurality of lenses, and  
said diffusion plate is arranged oppositely to said photodetector while  
sandwiching said lens group therebetween.

15           15. The thermal processing apparatus according to claim 13, wherein  
said imaging part has a lens group formed by a plurality of lenses, and  
said diffusion plate is arranged between said lens group and said photodetector.

20           16. The thermal processing apparatus according to claim 13, wherein  
said diffusion plate is made of quartz, while an incidence plane and an exit  
plane for said introduced light components form light diffusion surfaces.

17. The thermal processing apparatus according to claim 16, wherein  
said light introduction parts are made of quartz.